

**REMARKS**

Reconsideration of the application is respectfully requested in view of the following remarks.

Extruders have been known for the manufacture of ice cream, but as pointed out in the specification one of the problems faced is to keep the temperature as low as possible while maintaining an acceptable flow of the material. Unfortunately, use of low temperatures generates friction which reheats the product which is being cooled and therefore limits the (low) temperature which can be achieved. The present invention is directed to optimization of the geometry of the extruder in such a way that the increase in friction which is generated when the product is cooled is minimized in order to reach a temperature as low as possible.

Present claim 20 is directed to a combination of a single screw extruder and cooling liquid comprising an extruding screw and a barrel, the extruding screw having a length (LT) in contact with the barrel, a pitch length (Sp) and screw diameter (De) wherein the extruding screw is characterized by from 3 to 4 thread starts and a pitch angle of between 32 and 42°, the cooling liquid being ammonia. In claim 24, a combination single screw extruder and cooling liquid which is useful for manufacturing of a frozen food product is recited.

Rauwendaal, U.S. Patent No. 5,932,159 is cited by the Office as disclosing a single screw extruder comprising an extruding screw and a barrel characterized by from 3 to 4 thread starts and a pitch angle of from 30 to 90°. The undersigned has been informed, and Applicants submit, that prior to Applicants' invention one of ordinary skill would not use the Rauwendaal extruder for extruding a frozen confection. Rauwendaal is directed

primarily to extrusion of melted polymers. Although Rauwendaal mentions some viscous foods, the Office points to no teaching that those foods are, or should be, in the frozen state. The Office points to the teaching in column 2 of Rauwendaal that dispersive mixing should be done at as low a temperature as possible to increase the viscosity of the fluid and, with it the stresses in the polymer melt. However, this statement must be read in the context of the earlier sentence in the paragraph wherein it is said that significant mixing in screw extruders occurs only after the polymer has melted. Therefore any dispersive mixing spoken about in the last sentence of the first paragraph of column 2, "done at as low a temperature as possible," refers to a molten material. In contrast, the present invention is directed to extrusion of a frozen material, as reflected in the use of ammonia as a cooling agent.

It will be appreciated that ammonia is not an easy material to work with and that one would avoid use of it where possible. It is submitted that one of ordinary skill would not use ammonia except where very low temperatures were contemplated. Therefore, it defies common sense to think that Rauwendaal would suggest to one of ordinary skill the use of ammonia to cool his polymers or his non-frozen foods. Applicants are trying to maintain the frozen product such as ice cream at as low a temperature as possible and are trying to avoid melting. In contrast, Rauwendaal is generally working with melted polymeric materials and, in any event, the Office points to no suggestion that his extruder would be useful for frozen materials. Indeed, the Office points to no teaching of the use of Rauwendaal type extruders for frozen materials.

Fels et al., U.S. Patent No. 5,345,781 is directed to a device for cooling of edible foams. The Fels et al. device is said to be characterized in that the extruder device has at least one double screw system. Two classical examples of the food foams given are whipped cream and ice cream. In their background section, Fels et al. discuss deep

frozen products and indicate that although deep freezing was initially used only to keep vegetables fresh, the entire range of foodstuffs is presently available in deep frozen versions for all goods also available in fresh form. In column 6, third full paragraph Fels et al. indicate that the device according to their invention is for deep freezing, preferably to storage temperature of ice cream or other fluids down to temperatures of less than -10°C with simultaneous production of a creamy condition. It is characterized as implementing an essentially homogeneous mechanical energy input based on the use of double screw system.

Fels et al. mention at column 4 fruit foams such as foamed banana puree, and other milk products, such as fruit yogurts or similar items. This discussion occurs in the context of the previous sentence wherein it is said that edible foams can be produced on a basis other than whipped cream and, due to the freezing process they can be brought into a storable form. Thus, consistent with other portions of their patent, Fels et al. here seem to be speaking about deep freezing of fruit foams such as they are speaking about deep freezing of other products. However, the fact that Fels et al. are interested in deep freezing a range of food products does not, in any way, imply that extrusion by other inventors (e.g., Rauwendaal) of other food products, even if similar, are intended to be frozen. Thus, the fact that Fels et al. freeze fruit foams hardly can be taken to imply that in the Rauwendaal process the fruit slurries mentioned therein are intended to be frozen, particularly in the absence of any indication by the Examiner that Rauwendaal mentions freezing and in the context of the Rauwendaal process which is primarily for melted materials such as polymers.

The fact that Fels et al. mention the possibility of using ammonia is unsurprising considering their goal of deep freezing the products. The fact that Fels et al. may use ammonia to deep freeze fruit foams in their double screw extruder would not lead one

of ordinary skill to use in Rauwendaals' extruder liquid ammonia to treat his fruit slurries just because Rauwendaal mentions that the temperature of his molten polymer should be kept as low as possible.

It is submitted that one of ordinary skill would not be lead naturally by viewing the Fels et al and Rauwendaal references, without exposure to Applicants' specification, to take Rauwendaal et al's. extruder, which is used for molten plastic and foods, with no apparent mention of freezing, and apply Fels liquid ammonia cooling circuit which is used for Fels et al.'s deep freezing. Therefore, it is submitted that the Office has not established a *prima facie* case of obviousness and it is requested that the rejection be withdrawn.

The undersigned has been informed of some apparent anomalies in the data of the present example wherein torque values are higher at high temperatures wherein they would be expected to be lower since torque is a direct measurement of the hardness of the ice cream, which in turn is a direct consequence of its temperature. Nevertheless, since the Office has failed to establish a *prima facie* case of obviousness, it is respectfully requested that the rejection be withdrawn and the application be allowed.

In view of the foregoing, it is respectfully requested that the application be allowed.

Respectfully submitted,



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